Chinese, who are driven onwards by the misery and excess of population that exists in the southern provinces of China.——Sir Buonfanti, in his recent expedition across North Africa, was compelled to desist from his attempt to penetrate the unexplored region south of Adamawa, and finally, making his way to the Niger at Say, midway between Timbuktu and the Binue confluence, ascended the river to the former place. As this feat, before believed impossible, was performed in the dry season, the fact has considerable commercial importance. From Timbuktu the explorer passed through Massina and Bambarra to the almost unknown territory of Tombo, where the expedition was plundered and dispersed. After great sufferings, Sir Buonfanti reached a Catholic mission in the Bussanga country north of Dahomey.——In the western part of the Straits of Magellan glaciers exist on the slopes of a range of mountains the highest peaks of which are not above 4500 feet. The winds from the Pacific, eternally blowing from the west, and full of moisture, keep up a constant condensation, and the glaciers exist wherever the broken ground allows them a foot hold. The largest observed by Mr. W. J. L. Wharton was the Northbrook glacier, with an area of from fifty to seventy square miles.——The Russian government has under consideration a plan for an expedition to the North Pole. Depots will be established at the Jeannette, Bennett and Henriette islands. From these islands the journey will be continued to Franz-Josef Land by steamer, and thence on sledges and on foot.

GEOLOGY AND PALÆONTOLOGY.

BLANFORD ON HOMOTAXIS OF GEOLOGIC PERIODS.—In his address before the British Association for the Advancement of Science at Montreal, Mr. W. T. Blanford devoted considerable attention to some remarkable exceptions to the rule that similarity of faunas and floras in fossiliferous formations throughout the surface of the world implies identity of geological age.

Some interesting contributions have been made to this question by the geological survey of India, where Mr. Blanford's experience has been chiefly derived, and by the geologists of Australia and South Africa; and he first noticed a few typical instances, several of them Indian, in which the system of determining the age of various formations by the fauna or flora has led to contradictory results, and then showed where the source of error appears to lie. The famous Pikermi beds of Greece, a few miles east of Athens, contain a vertebrate fauna nearly always quoted as Miocene; but they overlie strata with well-proved Pliocene marine Mollusca. The Siwalik beds that flank the Himalaya north of Delhi are still classed as Miocene by most European writers, but are regarded as Pliocene by the Indian survey, on evidence found by tracing them west and south into Sind. The

Gondwána system of Central India, a great sequence of fresh-water beds probably of fluviatile origin, over 20,000 feet thick, is of unusual interest on account of the extraordinary conflict of palæontological evidence it presents.

Its subdivisions are numerous, and vary in almost every place of occurrence. One (the Tálchir beds) contains rounded boulders chiefly of metamorphic rocks up to six feet across, embedded in fine silt, others are characterized by an intermingling of floras and faunas that give rise to a mass of contradictions; beds with a Triassic fauna overlying others with Rhætic or Jurassic floras. The Australian coal-measures and their associated beds present even a more remarkable instance of homotaxial perversity, a Jurassic flora being of the same age as a carboniferous marine fauna. Some of these beds (Hawkesbury) again contain transported boulders, which occur once more in the lower members (Ecca beds) of the Karoo formation of interior South Africa. The latter presents a striking likeness to the Gondwána system of India. In both countries a thick fresh-water formation occupies a large area of the interior of the country, whilst on the coast some marine Jurassic and Cretaceous rocks are found; and as in India, so in South Africa, the uppermost inland Mesozoic fresh-water beds are capped by volcanic.

Other examples of discrepancies in palæontological evidence might be given, but he would add merely a mention of the single case known to him in which the discordant records are both marine, namely, Barrande's "colonies" in Bohemia; but here the discordance is much less than in the cases before cited, and moreover, Barrande's conclusion is disputed by other observers.

In most of the cases he had named the conflict is between the evidence of marine and terrestrial organisms. Manifestly one or the other of these leads to erroneous conclusions, and in making choice between the two, most geologists accept evidence of the marine fossils. The reason is not far to seek. So far as he was aware, no case is known where such an anomaly as that displayed in the Gondwánas of India has been detected amongst marine formations of which the sequence was unquestioned. Further, if we compare the distribution of marine with that of terrestrial and fresh-water animals and plants at the present day, we shall find a very striking difference; and it is possible that this difference may afford a clew to the conditions that prevailed in past times.

The idea that marine and terrestrial faunas and floras were similar throughout the world's surface in past times, is so ingrained in palæontological science that it will require many years yet before the fallacy of the assumption is generally admitted. No circumstance has contributed more widely to the belief than the supposed universal diffusion of the carboniferous flora. The evidence that the plants which prevailed in the coal-measures of Europe were replaced by totally different forms in Australia, de-

spite the closest similarity in the marine inhabitants of the two areas at the period, will probably go far to give the death blow to an hypothesis that rests upon no solid ground of observation. In a vast number of instances it has been assumed that similarity between fossil terrestrial faunas and floras proves identity of geological age; and by arguing in a vicious circle, the occurrence of similar types, assumed without sufficient proof to belong to the same geological period, has been alleged as evidence of the existence of similar forms in distant countries at the same time.—*Science.*

THE GLACIERS OF NEW ZEALAND.—The June issue of *Petermann's Mittheilungen* is occupied with an elaborate description of the Tasman glacier of New Zealand, and of its surroundings, by Dr. R. V. Lendenfeld. A map is given of the central part of the Alpine region of New Zealand, showing the glaciers, water-partings, rivers and lakes. Of these glaciers the Tasman descends lowest, the river of the same name flowing from its foot at an elevation of 730 meters. From the foot of Murchison glacier (1120) meters, the Murchison river flows beside the lower part of the Tasman glacier, and unites with the Tasman river near its foot. A little lower down the Tasman river is joined by the Hooker, flowing from the foot of Hooker glaciers (802 meters). The network of streams forming the Tasman debouch in Lake Pukaki at an elevation of 523 meters. From the Godley glacier, at an elevation of 1031 meters, flows the Godley, which uniting with the McCauley from an elevation of 1333 meters, forms Lake Tekapo at a height of 743 meters. This lake receives also the Cass, flowing from the foot of the Huxley glacier. The Tekapo and Pukaki, flowing from the lakes of the same names, unite to form the Waitangi, which receives also the Ohau, itself the offspring of the Hourglass and Richardson glaciers in 1163 and 1?39 meters respectively, and the Ahuriri. The Wanganui, Wataroa, Waiau, Weheka and Karangarua flow from the glaciers to the western coast. The rivers and glaciers of the western side of the Alps are shorter and smaller than those of the eastern side. The Tasman glacier is twenty-eight kilometers long, and is the largest of the glaciers of New Zealand.

THE ORIGIN OF THE MAMMALIA.[1]—The question as to the origin of the Mammalia has remained unsettled, and speculations have been divided as to whether the class has arisen by a modification of the Batrachia or of the Reptilia. Although there are cogent reasons why the descent should be from the former class, the evidence obtained up to this time from palæontology is in favor of the hypothesis of derivation from the Reptilia. The first evidence of this kind has been empirical and not conclusive.

[1] Synopsis of a paper read before the Amer. Assoc. Adv. Sci., Phila., 1884.

This consisted in the characters derived from the long bones of the limbs. Professor Owen first called attention to this resemblance in the genus Cynodraco, which is a Theromorph reptile. I next pointed out corresponding peculiarities in the bones of the American Theromorphs. I afterwards showed the resemblance between the pelvis of the Pelycosaur division and that of the Monotremata. This was followed by a demonstration of the resemblance between the coracoid of the Pelycosauria and the Mammalia Monotremata, especially to that of the genus Platypus. The present note now adds that the structure of the posterior foot approaches near to that of the Monotremata in having distinct navicular and cuboid bones, and that the astragalus and calcaneum are essentially like the corresponding part in the *Platypus anatinus*. The last two points are essential and fundamental. The three great distinctions between the Mammalia and the Reptilia in the skeleton are: (1) In the quadrate bone; (2) in the coracoid bone, and (3) in the occipital condyle. Of these the first is of less importance than has been believed, if, as maintained by Peters and others, it is to be excluded from the series of ear-bones. Its relations to the zygomatic arch in some Pelycosauria look as if Albrecht's view, that it represents part of the squamosal bone of Mammalia, is correct. The last character is weakened in importance by the fact that in some of the geckoes the condyle is double, which is due to the reduction of the basioccipital element and development of the occipital, thus agreeing fundamentally with the Mammalian condyle. The only interruption in the series which has not yet been overcome, is in the columella auris. No reptile is yet known where that element is divided into incus, orbicularis, and stapes as in the Mammalia and some Batrachia (according to Albrecht). Nevertheless the supposed columella auris, in some of the Pelycosauria, is divided at the end, so as to have two proximal termini, one of which may represent the incus. The malleus is distinct and is united by suture with the columella. In fact, most of the characters of the Batrachia, which have been cited by Huxley as indicative of the descent of Mammalia from that class, are found in the Pelycosaurian Reptilia. We give figures of these parts in the December NATURALIST.—*E. D. Cope.*

BEECHER'S CERATIOCARIDÆ OF PENNSYLVANIA.—This brochure, by Mr. C. E. Beecher, comprises descriptions of such Phyllocaridans as constitute the family Ceratiocaridæ, which have been collected in the rocks of the Chemung and Waverly groups of Pennsylvania, and is extracted from report of progress PPP, 2d geological survey of that State. Several new forms are described and well figured, and considerable structural details relating to the genus Echinocaris of Whitfield, with excellent figures on two plates. Special attention is called to the terminology, which is

illustrated by a woodcut; while a table is added giving the geological range of the genera Echinocaris, Elymocaris and Tropidocaris.

Two new genera (Elymocaris) with a new species (*E. siliqua*), Tropidocaris with three species (*T. bicarinata*, *T. interrupta* and *T. alternata*) are described, also *Echinocaris socialis*, n. sp. The illustrations are excellent. Every distinct, well preserved form of this group is of the greatest interest, and good figures of them are of special value. The point of greatest value in the paper is the identification and illustration of the mandibles, as Mr. Beecher claims them to be; they are very large, heavy and remarkably different from those of Nebalia, the existing type of the order.

NIAGARA FOSSILS.—Descriptions of a number of new species of Niagara fossils are published in the Bulletin of the Museum of the University of the State of Missouri, Vol. I, No. I, dated May, 1884, and with the above title.

The paper is written by Professor J. W. Spencer, of the University of Missouri, and contains sixty-two pages and nine plates. It is divided into three parts, as follows: Part I. Graptolitidæ of the Upper Silurian system; Pt. II. Stromatoporidæ of the Upper Silurian system; Pt. III. Fifteen new species of Niagara fossils.

The great majority of the specimens upon which the new species are based are from the Niagara shaly dolomite rocks of Hamilton, Ontario, Canada, and the types are in the private collection of Professor Spencer.

Among the Graptolites twenty new species and one new genus are described: Phyllograptus? 1, Dendrograptus 6, Callograptus 3, Dictyonema 2, Calyptograptus 2, Acanthograptus 1, Inocaulis 5, Cyclograptus (a new genus) 1; one of the new species of the Dictyonema is from the Clinton group.

Four new species of Stromatoporidæ are described from the Niagara group at Hamilton, Ontario, one from Dalhousie, New Brunswick, from the "Lower Helderberg?" group; they belong to the genera Cannopora 2, Cœnostoma 2, Dictyostoma 1.

From the Hamilton, Ontario, beds fifteen new species belonging to the following genera, are described: Palæaster, Fenestella, Polypora, Rhinopora, Clathropora?, Lingula, Discina, Crania, Pleurotomaria, Conularia, Orthoceras, Cyrtoceras, Lituites.

In regard to the Graptolites the author remarks that, "In the following descriptions I have often been compelled to depend almost entirely upon the size of the stipes and mode of branching, as the cellular structure has been obliterated in the majority of cases, even where the general form of the frond is perfectly distinct."

This remark draws attention to the evident imperfect condition of most of the specimens described and figured, which is very

unfortunate for any palæontologist who may in future have occasion to consult the paper or to identify kindred forms.

The paper will constitute No. 4 of Vol. IV of the Transactions of the St. Louis Academy of Sciences. Much careful study is exhibited in the details of the paper, and it is only to be regretted that the material at hand was of such imperfect nature.

The author regards the genus Inocaulis as a diprionidian graptolite, having found the axis central in specimens of *I. plumulosus*, this indicating a cellular system on both sides the stipe, although there is no distinct evidence of the lateral cells.

The genus Cyclograptus is established for a single discoid species with radiating stipes having central solid axes. This form is particularly interesting from its resemblance to the types of the Quebec group.

A large Conularia is described under the name *C. magnifica*, similar to but much larger than *C. niagarensis*. The specimen, if perfect, would be twenty-four centimeters long.

The author informs us that "the long buried treasures of the former geological survey of the State" (Missouri) have been unearthed.

It would be of value to science if some future Bulletin of the Museum would publish a list of the species contained in the museum which served as types for the numerous species described by Messrs. Shumard, Swallow, Norwood and others from the State of Missouri.—*H. S. Williams.*

GEOLOGICAL NOTES.—*Cambrian.*—Dr. Lehmann, whose quarto volume on the crystalline schists of Saxony is an important contribution to European geology, has abandoned the "Archæan" theory of the origin of these rocks. Below the Post-tertiary deposits of Saxony lies a central elliptic core of granulite rock, around which are grouped zones of various schistose rocks, passing outwards into the normal clay-slates of that part of Germany. On their south-eastern margin these rocks are unconformably overlaid by Silurian and Carboniferous rocks, but on the northwest a conformable sequence is traceable from the schists and slates upwards into Cambrian and Lower Silurian rocks precisely like those of the adjacent countries. Dr. Lehmann has come to the conclusion that the whole of the crystalline schists within the granulite area are metamorphosed Palæozoic sediments, originally of Cambrian or Silurian age. Their metamorphism probably took place during the crumpling and upheaval of the area, which took place later than the Devonian and older than the Carboniferous period. In the progressive intensity of metamorphism the most prominent fact is the corresponding advance in the development of mica. At the same time the muscovite, which alone is present in the outer parts of the area, is replaced further inwards by biotite. Where the crumpling is greatest most biotite occurs.

Dr. Lehmann believes that gabbro is an eruptive rock, younger than the granulite but older than the granite. It has been involved in the general metamorphism, and so has assumed schistose modifications. The Geological Survey of Scotland has recently arrived, independently, at similar conclusions with regard to the diorites and amphibolites of Aberdeen and Banff. The problem in Europe is linked with that presented by similar rocks in this country.

Devonian.—Dr. J. S. Newberry not long ago described the new placoderm genus Myzostoma, with two species, *variabilis* and *terreli* (Trans. N. Y. Acad. Sci. 1883). The teeth consist of strong and massive tables of bony tissue resembling enamel above, and disposed in pairs in both jaws. Those of the lower jaw are three to six inches long, and more than an inch wide. They resemble the teeth of Ceratodus. Only the teeth are yet known.

Carboniferous.—F. Roemer (Zeit. der Deutschen geol. Gesell.) describes *Belinurus silesiacus* from the coal measures of Upper Silesia. The cephalic shield is broad and strongly curved, terminating laterally in two horns, and the abdominal shield is short.

Cretaceous.—Dr. G. Schweinfurth (Zeit. der Deut. geol. Gesell.) contributes a geological map of the strata of the Mokattam mountains, near Cairo, showing the nummulitic Cretaceous strata, the Eocene strata with few nummulites, and the Pliocene red sandstone, rich in pholades.——W. Dames (Zeit. der. Deut. geol. Gesell.) contributes a monograph of the genus Ancistrodon. The teeth called by this name are pharyngeal teeth. As the genus is only found in marine beds, it can scarcely be cyprinoid, and among known pharyngeal teeth belonging to marine teleosteans, the only one resembling Ancistrodon are those of Balistes. But Plectognaths seldom occur in the older formations, whereas Ancistrodon is found in two formations and in both hemispheres. No well-grounded conjecture as to the exact relationships of these teeth can be made. Five species are enumerated, viz., *A. mosensis*, *libyanus*, *texanus*, *armatus* and *vicentinus*, all except the fourth of which are new. The first three are from the Cretaceous of Maestricht, the Lybian desert and Texas respectively; *A. armatus* is from the Eocene of France and Egypt, and *A. vicentinus* from the Oligocene of Upper Italy.——The coals and lignites of the Canadian Northwest are, according to Dr. G. M. Dawson, all of Cretaceous or Tertiary age. The only region yet examined in detail by the Geological Survey of Canada is the extensive one near the Bow and Belly rivers, from the base of the mountains to about the 111th meridian. Anthracite occurs where the Cretaceous rocks have been much disturbed and folded, but on the plains, away from the mountains, the coal assumes more or less the character of lignites.——The thesis presented

by M. de Lacvivier on his admission as doctor of the faculty of sciences, upon the Cretaceous beds of l'Ariège, is the result of many years of labor. The strata below the Cretaceous are not neglected. The writer describes new and interesting Devonian beds which he has discovered, chiefly marbles with remains of Goniatites. The Carboniferous is absent in the department, but the Trias and Jurassic are present, and to the latter must be referred a mass of dolomites and marbles which were previously believed to be Palæozoic, but which contain Jurassic fossils. The uneven surface of the Jurassic beds is filled by a ferruginous deposit (bauxite) forming the base of the Urgonian, which is succeeded by the Gault. Many new fossils are described from the Urgonian, and the Gault is highly fossiliferous. The Upper Cretaceous (Cenomanian, Turonian, Senonian) is completely uncomformable with the Lower.——Some pieces of pumice, thought to have come from Krakatoa, have been picked up at Mayotte, off the north-west coast of Madagascar.

Tertiary.—M. E. van den Brock has discovered fragments of Scandinavian rocks in the Post-tertiary deposits of Belgium. The only known piece large enough to be called an erratic block is of granite, measures $0.8 \times 0.5 + 0.6$ meters, and is imbedded in the fine Campinian sands of Wortel.

General.—A hundred and twenty pages of the Annales des Mines (1884, 2e livraison) are occupied by a study of the stratigraphical geology of the Hartz mountains, with especial reference to the plutonic rocks, diabases, porphyries, gabbros, granites, and to their enclosed metalliferous veins.——F. Kollbeck contributes to the Zeit. der Deut. geol. Gesell. an account of the extensive porphyritic rocks of Southern China.——Messrs. Steenstrup and Lorenzen (Zeit. der Deut. geol. Gesell., 1883) after a study of the so-called meteoric masses of iron in Greenland, conclude that these masses are telluric, and that the presence of nickel can no more be considered as an infallible evidence of meteoric origin.

MINERALOGY.[1]

New Minerals.—*Rinkite*[2] (Lorenzen).—Joh. Lorenzen, of Copenhagen, has given this name to a new mineral from Kangerdluarsuk in Greenland, in honor of Dr. Rink, recently director of the Danish Explorations in Greenland.

It occurs in crystals with arfvedsonite, ægirite, eudialite, steenstrupite, lithia mica, etc.

Monoclinic. Color golden-brown. Translucent in thin splinters, when unaltered; straw-yellow and earthy when altered. Hardness 5. Specific gravity 3.46.

[1] Edited by Professor H. Carvill Lewis, Academy of Natural Sciences, Phila.

[2] *Zeitsch. für Kryst.*, 1864, ix, p. 248.